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A COMPOSITION FOR LOW-WRINKLE AND LOW-SHRINKAGE FINISHING OF  
CELLULOSE-CONTAINING TEXTILE MATERIALS

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DESCRIPTION OF INVENTION  
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A COMPOSITION FOR LOW-WRINKLE AND LOW-SHRINKAGE FINISHING OF  
CELLULOSE-CONTAINING TEXTILE MATERIALS

[Stostav dlya malosminaemoi i malousadochnoi otdelki tsellyulozosoderzhashchikh telstil'nykh materialov]

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Applicant:	Ivanovo Scientific Research Institute of the Pulp and Paper Industry.
References cited:	1. Rzh Khim., 1978, Ref. 8T834. 2. Rzh Khim., 1976, Ref. 13T769. 3. B. N. Mel'nikov and T. D. Zakharova, Contemporary Methods for Final Finishing of Cellulose Fiber Fabrics [in Russian]. Moscow, Legkhaya industriya, 1975, p. 100, 118-122 (prototype).

Claim

A composition for low-wrinkle and low-shrinkage finishing of cellulose-containing textile materials, containing a precondensate of an aminoformaldehyde resin, a polyethylene emulsion, magnesium chloride or ammonium chloride, a formaldehyde acceptor based on urea, and water, which is distinguished by the fact that, with the goal of reducing the concentration of

free formaldehyde on a material, it contains thiourea dioxide as formaldehyde acceptor, with the following ratio of components, g/L;

Precondensate of aminoformaldehyde resin	40-75
Polyethylene emulsion, with respect to dry substance	3.3.-7.0
Magnesium chloride or ammonium chloride	3.0-7.0
Thiourea dioxide	0.85-1.70
Water	remainder to 1 L.

The invention relates to textile finishing, specifically to technology for low-wrinkle and low-shrinkage finishing.

To give cellulose-containing textile materials low-wrinkle and low-shrinkage properties, they are treated with compositions that are based on precondensates of aminoformaldehyde resins. After such treatment of a material, especially during its storage and use, free formaldehyde forms, which has allergic and carcinogenic properties. To reduce the concentration of free formaldehyde on the material, special substances that are capable of binding free formaldehyde, or formaldehyde acceptors, are added to the compositions.

There is a known composition for low-wrinkle and low-shrinkage finishing of cellulose-containing textile materials that contains: 125 g/L precondensate of aminoformaldehyde resin, 8 g/L catalyst for hardening based on a salt of an organic amine, 100 g/L ethylene glycol or glycerol as free formaldehyde acceptor, and water to 1 L [1].

A shortcoming of this composition is that the fabric acquires an unpleasant oily feel.

There is also a known composition for low-wrinkle and low-shrinkage finishing of cellulose-containing textile materials that contains: 90 g/L precondensate of aminoformaldehyde resin, 12 g/L magnesium chloride as hardening catalyst, 40 g/L ethyleneurea as free formaldehyde acceptor, and water to 1 L. Instead of magnesium chloride and ethyleneurea, the composition can contain a mixture of 20 g/L sodium carbonate and 10 g/L sodium bisulfite [2].

However, when ethyleneurea, which is in short supply and expensive, is used in the composition, the finishing effect is diminished, while when the mixture of sodium carbonate and sodium bisulfite is used, the strength of the material is reduced and, moreover, it is possible that dyes with which the fabric is colored will be degraded. This limits the sphere of potential use of such a composition.

Closest to the invention is a composition for low-wrinkle and low-shrinkage finishing of cellulose-containing fabrics that contains 45-120 g/L precondensate of aminoformaldehyde resin, 5-7 g/L acid hardening catalyst, 5-15 g/L urea or dicyanodiamide as formaldehyde acceptor, with the remainder being water up to 1 L. As a softener, this composition can contain 3.3-7.0 g/L polyethylene emulsion with respect to the dry substance. As the precondensate of

aminoformaldehyde resin the composition contains, for example, dimethylolurea, dimethylolethyleneurea, dimethyloldioxyethyleneurea and hexamethylolmelamine. The composition contains ammonium chloride or magnesium as catalyst [3].

A shortcoming of the known composition is that after finishing the material and, in particular, during its storage and use, a significant quantity of free formaldehyde forms on it.

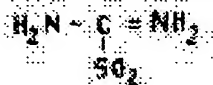
The goal of the invention is a reduction of the concentration of free formaldehyde on the material.

This goal is achieved by the fact that the composition for low-wrinkle and low-shrinkage finishing of cellulose-containing textiles materials that contains a precondensate of aminoformaldehyde resin, a polyethylene emulsion, magnesium chloride or ammonium chloride, a formaldehyde acceptor based on urea, and water, contains as formaldehyde acceptor thiourea dioxide in the following ratio of components, g/L:

Precondensate of aminoformaldehyde resin	40-75
Polyethylene emulsion, with respect to dry substance	3.3.-7.0
Magnesium chloride or ammonium chloride	3.0-7.0
Thiourea dioxide	0.85-1.70
Water	remainder to 1 L.

As precondensate of an aminoformaldehyde resin, the composition can contain, for example, the carbamol preparation TsEM, which is based on dimethylolethyleneurea, the carbamol preparation based on dimethylolurea, the carbamol preparation GL based on dioxyethyleneurea, or preparations based on hexamethylolmelamine.

Thiourea dioxide is a white crystalline substance of the formula



Its solubility in water at 20°C is 2.94%.

Example. Cotton cloth weighing 110-130 g per m<sup>2</sup> is impregnated in a padding machine with the composition given in Table 1, wrung out, dried at 100-110°C and heat treated at 140-150°C for 4-5 min.

The quality characteristics of the finish of the fabric and the concentration of free formaldehyde on it after finishing and after 4 weeks of storage are given in Table 2.

The concentration of free formaldehyde on the fabric was determined by Roff's method using chromotropic acid, the anti-wrinkle effect was evaluated from the total angle of opening of folds in accordance with GOST [All-Union State Standard] 19204-73, while the anti-shrinkage effect after washing was evaluated from GOST 8710-58, and the tensile strength of the fabric was determined in accordance with GOST 3813-72.

The invention makes it possible to reduce the concentration of free formaldehyde on the material both after finishing and, particularly, under conditions of its storage and use, improves the hygienic properties of the material, including popular cotton fabrics for shirts and dresses and children's wear and other articles made from them and, in addition, it improves the sanitary/hygienic conditions of work at textile finishing plants, sewing plants and in warehouses.

Table 1\*

Компонент	Содержание компонентов в составе и расчеты на сухое вещество, г/л										
	Состав										
	1	2	3	4	5	6	7	8	9	10	11
Карбамол ЦЭМ	75	62,5	50	-	-	-	-	-	75	-	75
Карбамол	-	-	-	40	-	-	-	-	-	-	-
Карбамол ГЛ	-	-	-	-	67,5	-	-	-	-	-	-
Предконденсат на основе гексаметиленовой ламина	-	-	-	-	-	75	50	62,5	-	75	-
Полиэтиленовая эмульсия	7	5	3,3	3,3	7	7	3,3	5	7	-	7
Хлористый аммоний	-	-	-	-	-	5	3	4	-	5	-
Хлористый магний кристаллический или в форме гекса- гидрата в расчете на кристаллический	7	6,0	4,7	4,7	7	-	-	-	7	7	7
Диуретик тиомочевина	1,7	1,5	1,2	0,85	1,7	1,7	1,2	1,5	-	-	-
Мочевина	-	-	-	-	-	-	-	-	15	15	-
Диэтиленгликоль	-	-	-	-	-	-	-	-	-	-	3
Вода	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л	До 1 л

- Key:
- 1 Component
  - 2 Concentration of components in composition, with respect to dry substance, g/L
  - 3 Composition No.
  - 4 Carbamol TsEM
  - 5 Carbamol
  - 6 Carbamol GL
  - 7 Precondensate based on hexamethylolmelamine
  - 8 Polyethylene emulsion
  - 9 Ammonium chloride
  - 10 Magnesium chloride, crystalline or in the form of the hexahydrate, with respect to crystalline magnesium chloride
  - 11 Thiourea dioxide

\* [Editor's note: commas in numbers in the tables represent decimal points.]

- 12 Urea
- 13 Dicyanodiamide
- 14 Water
- 15 To 1 L

Table 2

Показатели качества отделки	Предлагаемые составы								Известные составы		
	1	2	3	4	5	6	7	8	9	10	11
Содержание свободного формальдегида на ткани, %											
после отделки	0,15	0,12	0,06	0,07	0,03	0,11	0,08	0,09	0,26	0,22	0,25
после четырехнедельного хранения	0,18	0,16	0,14	0,19	0,08	-	-	-	0,57	-	0,56
Суммарный угол раскрытия складки, град	237	234	232	227	265	237	228	231	239	226	224
Усадка после стирки, %											
по основе	0,35	-	-	0,35	0,35	0	0,40	0,30	-	0,3	-
по утку	0,70	-	-	0,20	0,3	0,35	0,45	0,30	-	0,4	-
Разрывная нагрузка, г/нить											
по основе	268	270	275	282	230	-	-	-	270		255
по утку	494	510	535	543	480	-	-	-	491		533

- Key:
- 1 Quality characteristics of finish
  - 2 Proposed compositions
  - 3 Known compositions
  - 4 Concentration of free formaldehyde on fabric, %
  - 5 After finishing
  - 6 After 4 weeks of storage
  - 7 Total angle of spread of fold, deg
  - 8 Shrinkage after washing, %
  - 9 Along warp
  - 10 Along weft
  - 11 Tensile load, g/thread